

# Chlorsulfuron

## Roadside Vegetation Management Herbicide Fact Sheet



This fact sheet was developed by Oregon State University and Intertox, Inc. to assist interested parties in understanding the risks associated with pesticide use in Washington State Department of Transportation's (WSDOT) Integrated Vegetation Management program.

### Introduction

Chlorsulfuron is an herbicide that controls select broadleaf weeds and undesirable grasses. Chlorsulfuron stops cell division in plant roots and shoots, which in turn causes plants to stop growing. Chlorsulfuron is the active ingredient (75%) in **Telar XP**, and is combined with sulfometuron-methyl in **Landmark XP**. The herbicide is used by the Washington State Department of Transportation (WSDOT) for pre- and post-emergent (before and after growth begins) noxious and nuisance weed control.

WSDOT assessed the potential risks to humans, wildlife, and aquatic animals exposed to chlorsulfuron in their Integrated Vegetation Management (IVM) program. Evaluating potential risks takes into account both the toxicity of a pesticide and the characteristics of possible exposure.

### Application Rates and Use Patterns on Highway Rights-of-Way

Typical rights-of-way application rates for Telar XP range from 1 to 3 ounces—or a maximum of about 0.14 pounds of active ingredient per acre. Applicators use truck-mounted handguns, hose reels, or backpack sprayers to apply Telar XP from April to September. Landmark XP is used by WSDOT for pre-emergent weed control along the edge of pavement. Application rates for Landmark XP range from 4.5 to 9 ounces per acre, or a maximum of 0.14 pounds of chlorsulfuron per acre. Landmark XP is typically applied through use truck-mounted side booms mounted 18 inches from the ground. WSDOT workers applied an average of 200 pounds of chlorsulfuron per year statewide in 2004 and 2005.

**Laboratory Testing:** Before pesticides are registered by the U.S. Environmental Protection Agency (EPA), they must undergo laboratory testing for short-term (acute) and long-term (chronic) health effects. Laboratory animals are purposely fed doses high enough to cause toxic effects. These tests help scientists determine how chemicals might affect humans, domestic animals, or wildlife in cases of overexposure. Pesticide products used according to label directions are unlikely to cause toxic effects. The amount of pesticide that people and pets may be exposed to is low compared to the doses fed to laboratory animals.

### Human Health Effects

The U.S. Environmental Protection Agency (EPA) classifies chlorsulfuron as toxicity class III (low toxicity) with a signal word of CAUTION (see Toxicity Category and Signal Word text box).

*Acute toxicity:* Chlorsulfuron has low toxicity if individuals accidentally eat, touch, or inhale residues (see Laboratory Testing text box). Chlorsulfuron is a mild eye and skin irritant but not a skin sensitizer.

*Chronic toxicity:* Chlorsulfuron causes moderate body weight and food consumption decreases when fed to rats and mice for 18 months to 2 years. Chlorsulfuron caused no adverse health effects when fed to dogs at high doses for 6 months. However, it did cause decreases in weight gain and changes in the blood when fed to dogs in high doses for one year.

*Reproductive effects:* Chlorsulfuron causes a decrease in female fertility when fed to rats in moderate doses over three generations. It caused no birth defects when fed to rats in high doses during pregnancy.

Chlorsulfuron caused an increase in the number of resorbed (undeveloped) fetuses in females fed moderate doses. This is in conflict with a second study that showed no reproductive effects or birth defects in rabbits fed high doses.

### Toxicity Category and Signal Word

	High Toxicity ( <i>Danger</i> )	Moderate Toxicity ( <i>Warning</i> )	Low Toxicity ( <i>Caution</i> )	Very Low Toxicity ( <i>Caution</i> )
<b>Oral LD50</b>	Less than 50 mg/kg	50-500 mg/kg	500-5000 mg/kg	Greater than 5000 mg/kg
<b>Dermal LD50</b>	Less than 200 mg/kg	200-2000 mg/kg	2000-5000 mg/kg	Greater than 5000 mg/kg
<b>Inhalation LC50</b>	Less than 0.05 mg/l	0.05-0.5 mg/l	0.5-2.0 mg/l	Greater than 2.0 mg/l
<b>Eye Effects</b>	Corrosive	Irritation persisting for 7 days	Irritation reversible in 7 days	Minimal effects, gone in 24 hrs
<b>Skin Effects</b>	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation

Highlighted categories specify the range for chlorsulfuron use cited in this fact sheet.

**Carcinogenic effects:** Rats and mice fed moderate to high doses of chlorsulfuron for 18 months to 2 years show no increased incidence of tumors. The EPA classifies chlorsulfuron as having no evidence of carcinogenicity (causing cancer) based on a lack of evidence in rat and mice studies. Multiple studies show that chlorsulfuron is not a mutagen.

**Fate in humans and animals:** Rats rapidly excrete chlorsulfuron in their urine and feces. Chlorsulfuron does not bioaccumulate (build up) in mammals.

### Wildlife Effects

**Effects on Mammals:** Chlorsulfuron is practically nontoxic to mammals. The acute LD50 for rats fed chlorsulfuron ranges from 5,000 to 6,000 milligrams per kilogram (mg/kg) (see LD50/LC50 text box and Wildlife Toxicity Category table). Formulated Telar XP has low toxicity when exposed to the skin of rabbits with an LD50 of greater than 2000 mg/kg. The active ingredient by itself is even lower in toxicity, with a skin contact LD50 of 3,400 mg/kg. Chlorsulfuron does not irritate skin and is moderately irritating to eyes.

**Effects on birds:** Chlorsulfuron is practically nontoxic to birds. The acute LD50 for mallard ducks and bobwhite quail is greater than 5000 mg/kg.

**Effects on fish:** Chlorsulfuron is practically nontoxic to fish and does not tend to bioaccumulate (build up) in fish.

**Effects on aquatic invertebrates:** Chlorsulfuron is practically nontoxic to aquatic (water) insects and does not tend to bioaccumulate.

### Environmental Fate

The half-life for chlorsulfuron ranges from 1 to 3 months in soils with a

**LD50/LC50:** Acute toxicity is commonly measured by the lethal dose (LD) or lethal concentration (LC) that causes death in 50 percent of treated laboratory animals. LD50 indicates the dose of a chemical per unit body weight of an animal and is expressed as milligrams per kilogram (mg/kg). LC50 is the concentration of a chemical per volume of air or water and is expressed as milligrams per liter (mg/L). Chemicals are highly toxic when the LD50 or LC50 value is small and practically nontoxic when the value is large. However, the LD50 and LC50 do not reflect potential health effects such as cancer, birth defects, or reproductive toxicity that may occur at levels of exposure below those that cause death.

### Wildlife Toxicity Category

Risk Category	Mammals	Birds	Fish or Aquatic Insects
	Acute Oral or Dermal LD <sub>50</sub> (mg/kg)	Acute Oral LD <sub>50</sub> (mg/kg)	Acute LC <sub>50</sub> (mg/L)
Practically nontoxic	>2,000	>2,000	>100
Slightly toxic	501-2,000	501-2,000	>10-100
Moderately toxic	51-500	51-500	>1-10
Highly toxic	10-50	10-50	0.1-1
Very highly toxic	<10	<10	<0.1

Highlighted categories specify the range for chlorsulfuron use cited in this fact sheet.

typical half-life of 40 days (see Half-life text box). Soil microbes break down chlorsulfuron. Breakdown is faster in moist soils and at higher temperatures.

Chlorsulfuron has a high potential to contaminate groundwater, but current WSDOT application rates and use patterns are not likely to cause significant contamination.

### Human Health Risk Assessment

WSDOT evaluated several human exposure scenarios, including adults and children eating drift-contaminated garden vegetables or children directly touching drift-contaminated berries or sprayed vegetation. For each exposure scenario, WSDOT evaluated conditions of average exposure and extremely conservative conditions of maximum exposure. Based on these exposure scenarios, chlorsulfuron poses a negligible risk of adverse non-cancer effects to workers or the public (see Human Cancer/Non-cancer text box and Human Risk Classifications under Conditions of Average Exposure table). There is no evidence to support that chlorsulfuron causes cancer.

**Half-life** is the time required for half of the compound to degrade.

**1 half-life = 50% degraded**  
**2 half-lives = 75% degraded**  
**3 half-lives = 88% degraded**  
**4 half-lives = 94% degraded**  
**5 half-lives = 97% degraded**

Remember: the amount of a chemical remaining after a half-life will always depend on the amount of the chemical originally applied.

#### Human Cancer/Non-cancer Risk Classification:

Scientists estimate non-cancer health risks by generating a hazard quotient (HQ). This number is the exposure divided by the toxicity. When the HQ is less than 1, exposures are unlikely to cause any adverse health effects. When the HQ is greater than 1, potential non-cancer health effects may be possible. Risk assessments for chemicals that cause cancer (carcinogens) estimate the probability of an individual developing cancer over a lifetime. Cancer risks estimated in this way are very conservative, and actual cancer risks are likely to be much lower. Cancer risk estimates of less than 1 in 100,000 are within the range considered negligible by most regulatory agencies.

#### Human Risk Classifications under Conditions of Average Exposure

Hazard Quotient (Non-cancer Risk)	Cancer Risk	Potential Risks and Management Priority
Less than 1	Less than 1 in 100,000	<b>Negligible</b>
Between 1 and 10	Between 1 in 10,000 and 1 in 100,000	<b>Low</b>
Between 10 and 100	Between 4 in 1,000 and 1 in 10,000	<b>Moderate</b>
Greater than 100	Greater than 4 in 1,000	<b>High</b>

Note: Highlighted categories specify the range of potential risk for specific exposure scenarios involving chlorsulfuron.

### Wildlife Risk Assessment

Wildlife risk assessment considers pesticide behavior in the environment and routes of exposure. Indirect exposure to mammals and birds can occur when they eat contaminated prey or vegetation. Direct exposure can occur when mammals and birds contact chlorsulfuron residues with their skin or eyes or when they inhale chlorsulfuron vapors or particulates. WSDOT's current application rates and use patterns for chlorsulfuron pose a negligible risk to wildlife. Estimated dietary doses for rats, mice, and meadow voles are approximately 1,300 to 11,700 times lower than the rat LD50 of 2,341 mg/kg. The estimated dietary exposures for bobwhite quail, marsh wrens, and American robins are approximately 1,300 to 15,800 times lower than the bobwhite quail and mallard duck LD50 of 5,000 mg/kg. Chlorsulfuron does not bioaccumulate in wildlife.

### Aquatic Risk Assessment

WSDOT takes extra precautions applying herbicides near open water, wetlands, and wellhead protection zones. However, contamination may result from application drift, rainfall runoff, or residue leaching through the

soil into groundwater. Fish and water insect exposure to diuron occurs primarily through direct contact with contaminated surface waters. Chlorsulfuron is practically nontoxic to fish and aquatic insects (see Wildlife Toxicity Category table). Chlorsulfuron does not bioaccumulate (build up) in fish and aquatic insects; the risk to fish that eat exposed aquatic insects or other contaminated food sources is low. The risks associated with WSDOTS's current application rates and use patterns for chlorsulfuron are low in all areas of the state.

**Additional Resources**

- National Pesticide Information Center 1-800-858-PEST (7378) and <http://npic.orst.edu>
- Extension Toxicology Network (EXTOXNET) <http://extoxnet.orst.edu>
- Washington State Department of Transportation, Roadside Maintenance Branch 1-360-705-7865
- Washington Department of Agriculture, Pesticide Management Division 1-877-301-4555 (toll free)